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ABSTRACT

This publication is the examination booklet used for a home study course in water treatment. This course is the advanced part of a series produced by the Department of the Navy. This publication is designed to be used in conjunction with a course textbook. Each of the four examinations contained in this document are referenced to a specific section of the text. All of the questions are multiple choice and are cognitive or problem solving type questions. Each of the examinations contains 35 questions. Many of the questions have to do with water treatment and water pollution chemistry and with water treatment tests and equipment usage. (HR)

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NAVFAC P-350

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NTTC COURSE 315

ADVANCED WATER EXAMINATION

Prepared by

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NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA 23511

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
Washington, D. C. 20390

SE 023 887

NTTC COURSE 315

ADVANCED WATER

Prepared Under the Supervision of the
Naval Facilities Engineering Command

Administered by the NavFac Technical Training Center

This home study course consists of this examination booklet (including answer sheets) and a textbook.

TO GET THE MOST OUT OF THIS COURSE

If there is an errata sheet included with this course make all indicated changes and corrections in the examination booklet and the textbook.

Study those pages of the textbook listed for each examination. Pay particular attention to the illustrations, as they give a lot of information in a small space.

If the textbook contains a quiz at the end of each chapter and a review quiz at the end of the textbook, work them and check your answers with the correct ones at the end of the book.

When you have finished the required readings for an assignment, answer the questions in the examination booklet. Do not mark your answers in the examination booklet, use your answer sheet. Read each item carefully. Consult your textbook to help you select the best answer. You may discuss difficult points in the course with your supervisor. However, the answer that you select must be your own. Mark your answer in the answer sheet provided.

You may find that some of the text content has become obsolete since the text was written. However, since the course is based on the textbook, in answering items be sure to select the best answer from the information in the textbook. The obsolete matter in the textbook will be brought up to date when the text is revised.

Use a separate answer sheet for each examination and be sure that for each question you fill in only that space that corresponds in number and answer to that of the examination booklet. If you decide to change an answer be sure to erase the old answer completely. Do not cross it out.

Follow all directions printed on the answer sheet. Be sure to supply all the information requested.

You must attain an average grade of at least 3.2 to complete this course successfully.

I

NOTE: EXAMINATION QUESTIONS MUST BE RETURNED WITH FINAL ANSWER SHEET. NO GRADE OR CERTIFICATE WILL BE ISSUED UNTIL EXAMINATION QUESTIONS ARE RETURNED. TEXTBOOKS MAY BE KEPT.

Mail each answer sheet as soon as you have finished marking it. The answer sheets will be returned to you after grading. Incorrect answers will be marked with the page number in the textbook where the correct answer can be found.

When you have completed the course and examination questions have been returned you will receive formal notification of your final grade for the course.

The NavFac Technical Training Center will provide envelopes in which to mail your completed assignments and return your examination questions.

Be sure you check the examples shown on the following page for the correct method of filling in answer sheets.

Home study courses may include a variety of items -- multiple-choice, true-false, matching, etc. The items are not grouped by type; regardless of type, they are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Some courses use many types of items; others only a few. The student can readily identify the type of each item (and the action required of him) through inspection of the samples given below.

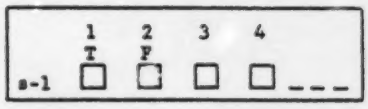
MULTIPLE-CHOICE ITEMS

Each item contains several alternatives, one of which provides the best answer to the item. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

s-1. The first person to be appointed Secretary of Defense under the National Security Act of 1947 was
1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

Indicate in this way on the answer sheet:



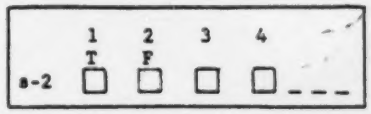
TRUE-FALSE ITEMS

Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the answer sheet.

SAMPLE

s-2. Any naval officer is authorized to correspond officially with a bureau of the Navy Department without his commanding officer's endorsement.

Indicate in this way on the answer sheet:



MATCHING ITEMS

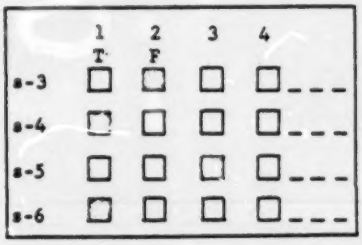
Each set of items consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Specific instructions are given with each set of items. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

SAMPLE

In items s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions.

A	B
s-3. Damage Control Assistant	1. Operations Department
s-4. CIC Officer	2. Engineering Department
s-5. Assistant for Disbursing	3. Supply Department
s-6. Communications Officer	

Indicate in this way on the answer sheet:



EXAMINATION 1

Textbook Assignment: Chapter 1, Page 1 through Chapter 2, Page 67

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1. Poor preventive maintenance and operation results in

   a. good functions
   b. better performance
   c. high cost repairs
   d. controlled efficiency

2. To understand the function, construction, operation and adjustment of equipment

   a. is of no value
   b. is important to the operator
   c. does not solve the problem
   d. might injure an operator

3. Instruction manuals on installation, operation and maintenance are

   a. useless
   b. of no value
   c. not worth reading
   d. important

4. Plan tool boards for the purpose of

   a. supporting work benches
   b. holding costly breakdowns
   c. adjusting tool bins
   d. holding all tools

5. Tools should be

   a. stored in bins
   b. supported on a tool board
   c. hidden in drawers
   d. left on the shop floor

6. If a Stillson Wrench is needed and not available

   a. request its purchase
   b. forget about it
   c. use pliers
   d. a hammer might help

7. Tool boards should be checked

   a. bi-weekly
   b. annually
   c. every hour
   d. daily

8. Spare parts are

   a. a nuisance
   b. important
   c. take up space
   d. a waste of time

9. Inventory of spare parts should be made

   a. weekly
   b. semi-annually
   c. daily
   d. every hour

10. Keeping a card file or book on tools, spare parts, equipment data, maintenance schedules, etc.

    a. is of no value
    b. is important for proper control and makes it easier to find the information
    c. takes too much time
    d. lacks information

11. In the overhaul of equipment, parts showing definite wear should be

    a. painted
    b. cleaned and greased
    c. replaced
    d. reinstalled

12. Proper lubrication, chart of oils, greases, etc., and schedule of application practices

    a. causes frequent breakdowns

b. is a must and extremely important
c. increases maintenance cost
d. does not provide simplification

13. One of the cleaning solvents used is

a. water
b. sand and grease
c. silica
d. kerosene

14. What chemical is used to clean mercury contaminated with grease and oil?

a. calcium
b. barium
c. potassium hydroxide
d. oxygen

15. What does dilute nitric acid remove from mercury?

a. grease
b. solids of corrosion products and water
c. oil
d. vaseline

16. To prevent ice thrust during freezing weather to a water filled tank removed from service, what protection should be given?

a. spread surface with calcium
b. use it for ice skating
c. cut a hole in ice and keep it open, or insert logs or inflated inner tubes along walls
d. add more ice

17. Equipment out of service for long periods

a. requires no attention
b. should be protected from corrosion by the use of lubricants
c. covered with gauze
d. install a humidifier adjacent to equipment

18. Gasoline engine used as standby equipment should

a. have crank case oil drained monthly
b. be operated weekly and bettery and all parts checked
c. be left alone
d. operate on an annual basis

19. Wick oil bearings require

a. ample grease
b. that cups be filled with number 30 weight oil
c. an excessive amount of oil
d. few drops of mineral oil

20. Kingsbury type thrust bearing

a. is a wick oiled bearing
b. requires no attention
c. is a pivoted-shoe type oil bearing
d. is a roller bearing

21. For what purpose is sodium thiosulfate placed in the bacteriological sample bottle of waters containing residual chlorine?

a. to destroy the bacteria
b. to incubate
c. to neutralize the chlorine residual
d. to remove the turbidity

22. At what temperature must bacteriological bottles be sterilized before taking samples?

a. 80°F
b. 50°C
c. 70°C
d. 121°C

23. What is the time allowed for transporting or storing a bacteriological sample of a relatively pure water from the filling of the sample bottle to the beginning of the examination?

a. 12 hours
b. 80 hours
c. 40 hours
d. 60 hours

24. What is the purpose of performing a daily jar test?

a. To measure the quantity of chloramines
b. Determine the quantity of coagulant required
c. To identify the bacteria
d. To verify the oxygen content in the water

25. 93.00 percent sulphuric acid has a specific gravity of 1.8279.' Calculate the weight of one liter in grams.

a. 1000
b. 1827.9
c. 5000
d. 1500

26. Calculate from above problem 25. Grams of acid per liter

a. 1800
b. 1100
c. 1500
d. 1700

27. Calculate from problem 25. Pounds of acid per cubic foot

a. 93
b. 106
c. 203
d. 40

28. Calculate from problem 25. Pounds of acid per gallon

a. 141.8
b. 106
c. 95
d. 14.18

29. Calculate from problem 25. Gallons of the 93 percent acid required per hour to treat a flow of 5 million gallons per day at a rate of 2 parts per million

a. 244.0 gallons per hour
b. 0.244 gallons per hour
c. 488 gallons per hour
d. 93 gallons per hour

30. What weight of hydrated lime $Ca(OH)_2$, will neutralize 40 pounds of sulphuric acid?

a. 74.10
b. 32.0
c. 30.2
d. 98.08

31. A solution of ammonia in water contains 28 percent ammonia. Its specific gravity is 0.8980. Calculate pounds of ammonia per cubic foot of solution

a. 15.7
b. 157
c. 28
d. .8980

32. Calculate the grams of ammonia per liter of solution from problem 31 above

a. 2514
b. 251.44
c. 251
d. 25

33. Calculate the grains per gallon from problem 31 above.

a. 15.7
b. 7.48
c. 2.10
d. 14,700

34. Calculate the percent by weight of aluminum in pure Al_2O_3

a. 53.94%
b. 26.97%
c. 52.9%
d. 101.9%

35. What weight of hydrated lime $Ca(OH)_2$ will react to neutralize 60 pounds of sulphuric acid (H_2SO_4)?

a. 45.03
b. 98.08
c. 74.10
d. 30.2

EXAMINATION 2

Chapter 2, Page 67 through Chapter 2, Page 182

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1. One grain per gallon is equal to how many parts per million?

   a. 7000
   b. 437.5
   c. 17.1
   d. 10

2. 480 ppm is equal to how many grains per U. S. gallon?

   a. 14
   b. 240
   c. 17.1
   d. 28

3. 56 grains per U. S. Gallon is equal to how many pounds per 1000 gallons?

   a. 143
   b. 6.05
   c. 8.008
   d. .572

4. One part per million is equal to how many pounds per million gallons?

   a. 8.34
   b. 58,000
   c. 7,000
   d. 437.5

5. 142.9 pounds per million gallons is equal to how many grains per U. S. Gallon?

   a. 58,380
   b. 7000
   c. 1
   d. 8.34

6. The Fahrenheit temperature of water 220^0, what is it in Centigrade?

   a. 116^o
   b. 112^o

c. 120°
d. 104.4°

7. One gallon of water weighs 8.34 pounds. How much does one pound of water weigh in grains?

a. 142.9
b. 7000
c. 437.5
d. 17.1

8. .05380 grains per gallon is equal to how many grains per million gallons?

a. 1,000,000
b. 10,000
c. 7,000
d. 53,800

9. 0.572 pounds per 1000 gallons is equal to how many pounds per gallon?

a. 10
b. .000572
c. .01
d. .75

10. Two pounds per 1000 gallons of water is equal to how many parts per million?

a. 120
b. 480
c. 60
d. 240

11. 7000 grains per pound is equal to how many grains per ounce?

a. 8.34
b. 58,380
c. .05838
d. 437.5

12. 40 grains per U. S. gallon is equal to how many pounds per 1000 gallons?

a. 5720
b. 572
c. 5.72
d. 143

13. 572 pounds per 1000 gallons is equal to how many grains per U. S. gallon?

a. 4004
b. 40.04
c. .4004
d. 7000

14. How many grains are there in 8.34 pounds?

a. 7000
b. 437.5
c. 8340
d. 58,380

15. One grain per gallon is equal to how many pounds per million gallons?

a. 142.9
b. 1429
c. 7000
d. 8.34

16. 15 U. S. gallons is equal to how many cubic inches?

a. 3465
b. 2310
c. 833
d. 8.34

17. 13 liters per second is equal to how many U. S. gallons per minute?

a. 2.00
b. 4.078
c. 2.057
d. 206.05

18. One milligram is equal to how many grains?

a. 0.0154
b. 154
c. 15.432
d. 16

19. One grain is equal to how many milligrams?

a. 648.1
b. 15.432

c. 64.81
d. .9842

20. One ounce is equal to how many grains?

a. 20
b. 437.5
c. 43.75
d. 7000

21. A water supply containing 38 ppm of calcium, 9.0 ppm of magnesium and 160 ppm bicarbonate would be considered as

a. soft water
b. hard water
c. acid water
d. heavy water

22. What is the correct symbol and valence for bicarbonate?

a. CO^{--}
b. $C1^{3-}$
c. PO_4^{---}
d. HCO_3^-

23. What is HCl?

a. hydrogen oxide
b. sulfuric acid
c. hydrochloric acid or hydrogan chloride
d. bicarbonate

24. What is a radical?

a. a group of formulas
b. group of elements behaving as a single element
c. criss-crossing valence numbers
d. an equation

25. How many ammonium ions are required to satisfy carbonate ions?

a. +1
b. -4
c. +2
d. -3

26. What is a cation?

a. one which has a positive charge
b. an element
c. a reaction
d. one having a negative charge

27. What are the valence numbers of $Al_2(SO_4)_3$?

a. -2, +6, -4
b. +2, +2, -4
c. -2, +10, -8
d. +6, +18, -24

28. What is the correct formula for ferric sulfate?

a. $Fe_2(SO_4)_3$
b. $Fe(OH)_3$
c. $Fe\ SO_4$
d. $Fe(HCO_3)_2$

29. What chemicals are required to complete the reaction of calcium sulfate ($CaSO_4$) + sodium carbonate?

a. $CaCo_3 + {}_2Na_2Cl$
b. $CaCo_2 + Na_2NO_3$
c. $CaCO_3 + Na_2SO_4$
d. $Mg(HCO_3)_2 + 2Ca(OH)_2$

30. How many grains per gallon is equal to one part per million?

a. .0581
b. .833
c. .583
d. 1.0

31. A dry feed dosage of 5 grains per gallon requires that how much of the chemical in ounces be fed per minute to 100 gallons per minute?

a. 1.8284 ounces
b. 0.5714 ounces
c. 2.8570 ounces
d. 1.1428 ounces

32. If filter alum is used; what is its alkalinity reduction in parts per million?

a. 0.45

b. 0.32
c. 0.29
d. 0.51

33. In problem 32, what is the sodium sulfate increase in parts per million?

a. 1.07
b. 1.42
c. 1.35
d. 0.64

34. What is the alkalinity reduction in parts per million when potash alum is used?

a. 0.32
b. 0.34
c. 0.75
d. 0.63

35. What is the alkalinity increase in ppm when $NaHCO_3$ is used?

a. 1.23
b. 1.61
c. 0.60
d. 1.26

EXAMINATION 3

Textbook Assignment: Chapter 3, Page 183 through Chapter 3, Page 226

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1. A new well water supply should be disinfected with

   a. calcium
   b. aluminum sulfate
   c. chlorine
   d. quicklime

2. A well that is contaminated means the water is

   a. safe to drink
   b. free of coliform bacteria
   c. distilled
   d. unsafe to drink

3. A dug well located 35 feet from a septic tank

   a. is satisfactory
   b. is not accepted by Public Health Authorities
   c. is in danger of cave in of septic tank
   d. should be closer

4. One of the causes of river and lake stream contamination is

   a. the many municipalities discharging complete treated sewage into the river
   b. rainfall
   c. cities discharging raw sewage into the water
   d. specific distance of river too short

5. Bacteriological examination of water determines

   a. the calcium chloride content
   b. whether it is positive or negative
   c. its natural self-purification
   d. that it comes from fissured rock

6. Watershed areas must be protected

   a. by using it for pasture land
   b. by dense reforestation
   c. for farming
   d. for recreation purposes

7. When a dug well is removed for repairs, at end of each day until well is repaired and back in service

   a. always cover opening
   b. leave the well open to the air
   c. reinstall well pump
   d. let surface water drain into well

8. Disinfection of a new or repaired well

   a. is an important function
   b. does not eliminate pollution
   c. helps the turbidity
   d. increases the potassium concentration in the water

9. Backsiphonage is backflow caused by

   a. positive pressure in the potable water system
   b. air space
   c. negative pressure in potable water supply
   d. an indirect open sight drain

10. Interconnection is a

   a. physical connection between the potable water systems
   b. valved pipe end with open connection
   c. physical connection between potable supply of sewer
   d. dual system

11. Cross connection is any arrangement of the

   a. potable water supply and nonpotable supply connected
   b. interconnection of piping
   c. where they cross carrying nonpotable water
   d. piping that operates independently

12. In the process of insuring a safe water supply what disinfectant is widely accepted for use in drinking water?

   a. carbonate

b. potassium
c. chlorine
d. sulfide

13. What chemical is a greenish yellow gas and is heavier than air?

a. sulfur
b. alcohol
c. carbon monoxide
d. chlorine

14. The effectiveness of free available chlorine is a function of the

a. pH
b. organisms
c. growth
d. light

15. Liquid chlorine is shipped in

a. tin cans
b. glass bottles
c. 55 gallon drums
d. steel cylinders

16. Chlorine gas leaks in a chlorination room are located by one of the following

a. observation
b. corrosion along the chlorine lines
c. the use of a bottle of ammonia and with an extended wick passed along the chlorine line and equipment
d. use of a gas mask

17. How is a chlorine gas leak identified?

a. by green clouds at location of leak
b. dripping of water
c. condensation at location of leak
d. white cloud appears at any point of leak when exposed to amonia.

18. Bactericidal effectiveness of chlorine depends upon four conditions, one of which is

a. chlorine residual
b. complex chlorine
c. amounts of ammonia and nitrogenous organic substances
d. various substances

19. Chloramines are formed by adding chlorine and

a. chlorides
b. hypochlorite
c. ammonia
d. sodium

20. An excess of chlorine can be absorbed by

a. activated carbon
b. chloramines
c. calcium hypochlorite
d. [illegible]ak point chlorination

21. Gas chlorinators introduce chlorine gas into the water supply by two different methods

a. full vacuum or gravity feed
b. dry feed or solution feed
c. pulsating and volumetric feed
d. orifice meter or discharge feed

22. A full vacuum chlorine feeder is the type

a. where the flow of chlorine is automatically shut off on loss of vacuum
b. which employs partial vacuum
c. that is controlled by pulsating action
d. that employs a direct indicating meter opening the inlet valve

23. Hypochlorinators are most frequently used

a. to dechlorinate a water supply system
b. to increase the water pressure
c. to control the hydraulic system
d. to sterilize new and repaired water mains

24. Calculate the most of 3000 pounds of available chlorine at 11-1/4 cents per pound

a. $337.50
b. $375.00
c. $111.25
d. $222.50

25. Calculate the amount of calcium hyprochlorite 70% available chlorine required to produce 200 pounds of available chlorine

a. 186
b. 143
c. 286
d. 1000

26. Calculate the amount of sodium hypochlorite 10% available chlorine required to produce 400 pounds of available chlorine

a. 2860
b. 4000
c. 2500
d. 600

27. Find dosage for chlorine gas in parts per million when the rate of feed in pounds per day of chlorine gas is 41.70 pounds and the daily flow is 5 million gallons per day.

a. 8.34
b. 5.0
c. 4.1
d. 1.0

28. How many grains per gallon is equal to one part per million?

a. .12
b. .007
c. .058
d. 7000

29. One pound is equal to how many parts per million gallons?

a. .12
b. .007
c. .5
d. .058

30. 10,000 parts per million available chlorine is equal to what percent solution?

a. 10
b. .5
c. 2
d. 1

31. What two factors determine whether the water will spread disease or cause physical disturbance?

a. low concentrations of iron and manganese
b. bacterial and chemical content
c. scale formation and corrosion
d. oxygen and hexametaphlosate

32. What is the safe amount in parts per million of copper sulfate required to destroy most algae in a soft water without killing fish?

a. 10 ppm
b. 20 ppm
c. 5 ppm
d. 1 ppm

33. What other chemical is used to destroy most algae?

a. chlorine
b. calcium
c. silica in solution
d. bicarbonate

34. What is the purpose in using activated carbon for algae control?

a. to add taste
b. to absorb all light
c. to remove the oxygen
d. to increase the color concentration

35. What is the purpose of aeration?

a. increase the carbon dioxide in the water
b. add plankton
c. release to the atmosphere dissolved gases
d. to decompose organic matter

EXAMINATION 4

Textbook Assignment: Chapter 3, Page 224 through Chapter 4

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1. What other purpose is activated carbon used for?

   a. remove the sodium chloride
   b. increase the silica content
   c. reduce the bicarbonates
   d. remove taste and odors

2. What guide is used to determine scale-forming action of a water?

   a. slide rule
   b. Langelier index
   c. the low oxygen concentration
   d. turbidimeter

3. What are the effects of corrosion in pipes?

   a. rusty red or orange incrustation
   b. white deposits
   c. insufficient oxygen
   d. calcium formation

4. What is the purpose of using test loop nipples?

   a. to determine the organic matter in the water
   b. to evaluate the quality of the water
   c. evaluate the degree of scale and corrosion deposits
   d. to control the flow

5. The presence of iron in excess of 0.3 ppm causes

   a. the water to be palatable
   b. taste and reddish color
   c. the buildup of calcium
   d. the increase in hydroxide alkalinity

6. When water is aerated, what happens to the carbon dioxide?

   a. nothing happens
   b. it is converted to carbon monoxide
   c. it increases in concentration
   d. it is released

7. What is coagulation?

   a. it is a chemical action which prevents flocculation
   b. it is the function of clogging filters
   c. it is method of producing a chemical balance in the water
   d. it is the formation of gelatinous particles in water by chemical action

8. When alum is added to water containing sufficient natural alkalinity, what happens to the calcium bicarbonate?

   a. it is reduced in quantity
   b. it becomes carbon dioxide
   c. it is increased in quantity
   d. it is converted to calcium sulfate.

9. When calcium bicarbonate is added to sodium aluminate, what is the reaction?

   a. calcium aluminate and sodium bicarbonate
   b. calcium hydroxide and sodium aluminate
   c. ferrous sulfate and calcium hydroxide
   d. ferrous hydroxide and calcium sulfate

10. What is ferrous sulfate ($FeSO_4$) commonly called?

    a. soda ash
    b. copper sulfate
    c. sodium hydroxide
    d. copperas

11. What is anthrafilt?

    a. is the dirty top layer of the sand filter
    b. it is used as a filtering media and is obtained from freshly mined anthracite coal
    c. it is river dredged sand
    d. it is a disease that comes from dirty sand filters

12. When water is filtered, what takes place on the surfaces of the filter medium?

    a. nothing
    b. water percolates thru the sand
    c. a sticky coating is formed on the media surface
    d. suspended particles settle at the bottom of the sand bed

13. What chemicals are exchanged in the water by the sodium zeolite softener?

    a. calcium or magnesium
    b. bicarbonate or carbonate
    c. silica and sodium
    d. chloride or sulfite

14. What is the amount of regeneration salt depended upon?

    a. efficient operation
    b. the amount of calcium removed
    c. dilution
    d. the amount of zeolite in the bed and its softening capacity

15. What is the amount of pure soap consumed in pounds per 1000 gallons with a water having 85.5 parts per million of hardness and 1,000,000 gallons of water was used?

    a. 6700 pounds
    b. 700 pounds
    c. 600 pounds
    d. 5700 pounds

16. What is one of the important functions of a distribution system?

    a. maintain the water quality
    b. keep maps up to date
    c. carry potable water for domestic use
    d. if the bacteriological examination is negative, redisinfect the system

17. A safe water supply is one in which the results of the bacteriological examination is

    a. positive
    b. negative
    c. free of carbon dioxide
    d. highly concentrated with oxygen

18. What is crenothrix?

    a. oxidizing agent
    b. coliform
    c. marginal chlorine residual
    d. iron bacteria

19. Name one method of removing organic deposits in a distribution system.

a. high velocity flushing
b. reduce the flow in the pipe
c. increase the lime dosage
d. maintain the pH of the water above the saturation point

20. How can sulfur organisms be eliminated?

a. reduce the water usage
b. marginal chlorination
c. oxidize the available chlorine
d. release the free carbon dioxide

21. What is the depth of flow in a 12 inch diameter pipe when its cross-sectional area is .50?

a. 4"
b. 5 1/2"
c. 8"
d. 7 1/4"

22. A 15" diameter pipe has its water depth at 7 1/4", what is its cross-sectional area?

a. .59
b. .46
c. .62
d. .51

23. What is the volume in U. S. gallon per foot of length of a 15" pipe with a depth of flow of 12"?

a. 8.333 gallons
b. 7.458 "
c. 7.854 "
d. 6.666 "

24. What is the discharge in gallons per minute thru a 1 inch iron pipe with a pressure of 30 pounds per square inch and 35 feet of service pipe?

a. 4.93 gpm.
b. 5.75 "
c. 63.55 "
d. 45.90 "

25. Why are altitude valves used?

a. to control the oxygen in a system
b. to prevent tanks from overflowing
c. maintain low pressures in a system
d. to increase surges in a system

26. What is the purpose of a check valve in a distribution system?

a. allows the water in a pipe to flow in one direction only
b. to increase the flow of water
c. reduce the friction loss in a system
d. allow water to flow in both directions

27. What is a surge in a distribution system?

a. it is a momentary reduction of oxygen in the system
b. it controls the flow of water in a system
c. it is a low velocity flow
d. it is a momentary increase in pressure, caused by sudden changes in water velocity

28. What is the number of gallons of water wasted per month from a 1/2" diameter leak at 40 pounds pressure?

a. 2,000,000 gallons per month
b. 410,000 " " "
c. 1,231,000 " " "
d. 690,000 " " "

29. At 25 cents per 1,000 gallons for water, what is the annual cost, if the water leak per 24 hours ammounted to 10,000 gallons?

a. $10,000.00
b. $ 935.06
c. $ 561.04
d. $ 912.00

30. How many gallons of water are wasted per month, from a 1/4" diameter size water leak at 40 pounds pressure?

a. 307,700 gallons per month
b. 176,900 " " "
c. 76,900 " " "
d. 19,200 " " "

31. Compute the annual cost of the amount of water wasted in problem 30 if the cost per 1,000 gallons is 30 cents.

a. $ 935.06
b. $1122.07
c. $1107.72
d. $ 897.66

32. With a 1/32 inch diameter water leak at 40 pounds pressure, what is the annual number of gallons wasted?

a. 57,600 gallons
b. 692,400 "
c. 76,900 "
d. 19,200 "

33. What is the annual cost of water wasted in problem 32 if the cost per 1,000 gallons is 30 cents?

a. $172.80
b. $ 72.80
c. $ 27.80
d. $ 17.28

34. In problem 33, if there are 20 1/32 inch diameter water leaks, what is the monthly number of gallons wasted for the 20 leaks?

a. 96,000
b. 196,000
c. 19,200
d. 76,900

35. In problem 34, what is the annual cost of the wasted water at 25 cents per 1,000 gallons?

a. $448.82
b. $224.41
c. $388.80
d. $288.00

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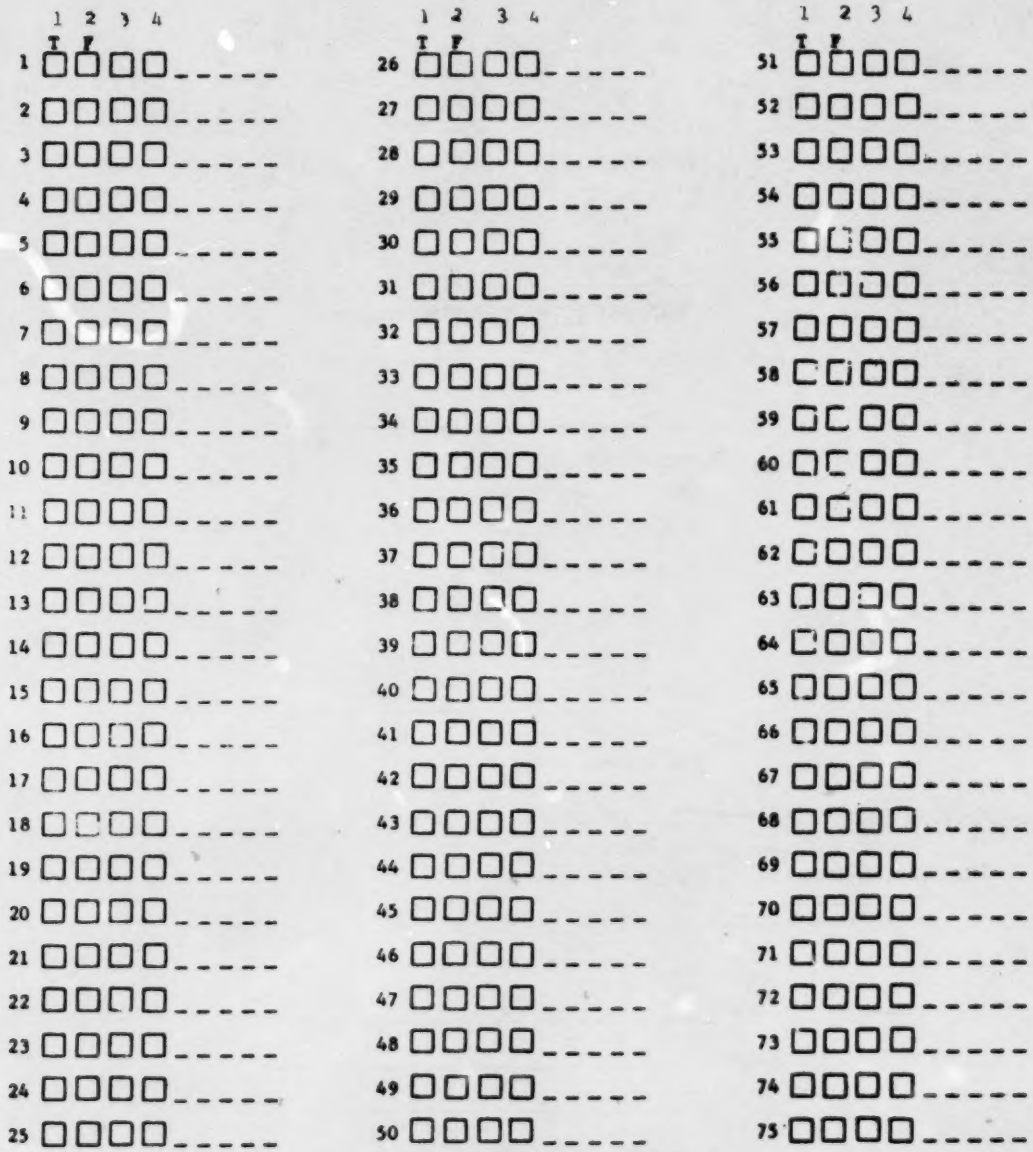

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